

Defining Inquiry-Based Learning

What is inquiry-based learning? There are as many specific answers as there are people to ask, but there are common themes to the descriptions that represent a core of belief about inquiry. The list below is loosely based on Nickerson (1988), but includes some additional thematic elements and some connections to technology.

Constructivism. The major claim of this theme is that learning is an active process, described as forming new mental models rather than as assimilating information. Students continually create their own mental models as they encounter new material. It is questionable if "passive learning" could even exist. Integral to the concept of constructivism is the notion that much of learning comes from grappling with complex problems, for which there may be multiple approaches. The interaction a learner has with others engaged in the task adds to the learning potential; language is the most important carrier of these inquiry-supporting interactions. Out of such experiences, learners build their own knowledge.

Importance of conceptual understanding, rather than procedural efficiency. Especially in math and science, much of the knowledge students are often expected to know is procedural; that is, how to follow particular rote recipes. If this knowledge is not situated in an understanding of how and why the procedures work, students may not be able to know when and how to use them. Conceptual understanding includes a much richer and more flexible array of knowledge that makes it possible for students to think deeply even without a procedure, to know when and how to apply proper procedures, and to interpret their results appropriately.

Responsiveness to what students already know. No student enters a class as an empty vessel. Education must take account of what students bring with them. Based on life and school experiences, every student has formed many ideas about math, science, social studies, writing, etc. Some of these pre-existing ideas are valuable bases for continued learning; others are wrong and would lead the student further into territory that is not educationally useful. Students' incorrect ideas have sometimes been called "misconceptions" and inquiry-oriented methods to help students reform their ideas into more correct conceptions have been designed. Technology can play a role in this regard by assisting teachers in understanding students' knowledge and current conceptions, as many pieces of software help students display their thinking and procedures in a more accessible form.

Connections to the world outside of schools. Research is beginning to show that one problem with school learning is that students often fail to connect it to what they have learned outside school. Students often bring knowledge to class that is directly relevant to what they are learning, but fail to see the connection. In response to this issue, some of the new curriculum efforts are focusing on the creation of authentic tasks which meet needs and goals that students either have already or might have in the future. Furthermore, students often fail to see how the work they do in school is related to their lives at home. Parents can do much to support home-school connections, but research has documented most parents' lack of connection with their children's schools. Chris Dede (O'Neil, 1995) claims that "We

know that the biggest single impact that we could make in the lives of many children would be to involve their parents more deeply in their learning" (p. 10).

Metacognition. Students need to know how to take responsibility for managing and monitoring their own thinking and learning activities. These kinds of skills (e.g., knowing when you have learned something or planning to use your most effective learning strategies to master some content) are sometimes called "metacognitive skills" because they require the students to examine their own learning practices. In an inquiry-based perspective, students need to reflect on the steps they take to generate questions about a new topic, how they collect information to help focus on a smaller set of questions, how they evaluate the relevance of the information, how they decide to what steps to take next, and how they communicate their conclusions. Unfortunately, most curricula do not explicitly call for a focus on metacognitive learning.

Lifelong learning. The students of today will need to learn throughout their lives. In the past, technology and jobs changed relatively slowly, but today's world can change practically overnight. Many of today's jobs require facility with technologies that didn't exist 20 years ago, and reeducation is the only way some people can continue to work at skilled jobs. Students need to prepare in school to continue to learn for the rest of their lives; in terms of inquiry, this means cultivating curiosity, knowing where learning resources might be, having experience with tackling complex problems, and knowing how to work with others in crafting approaches to difficult situations.

What does a classroom in which inquiry is taking place look like? Commonly, some or all of the following characteristics are present:

- Questions are, in general, complex.
- Answers to questions are open-ended.
- Most questions have more than one right answer or more than one way to get to a right answer or both.
- Students are assessed by how they get to the answer, as well as the answer itself.
- Discussion among students or between students and teacher is part of the process.
- Students have to plan and organize as part of their work on a problem.
- Communication takes place in multiple modalities and forms--both oral and written, pictorial, graphical, and symbolic.
- Teachers play a role as facilitators of learning, rather than as transmitters of information.

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